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# THE UNIVERSITY OF TORONTO MEDICAL JOURNAL

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## EDITORIAL

### THE LYMPHO-EPITHELIOMA.

No doubt many were diconcerted somewhat by a question on the October paper of last year on the Dominion Council in Pathology, asking for the definition of Lympho-epithelioma. This tumour is not to be found in many of the standard text-books, and even in Ewing's text but a few lines are devoted to it.

The neoplasm is described as arising in the faucial tonsil and lymphoid tissue at the base of the tongue or in the naso-pharynx, early metastisizing to the neighbouring cervical lymph glands, while the primary remains small. The symptoms of painless swelling on one side of the neck is the only one of which the patient complains, till late metastases in the liver, lungs and bone marrow bring a rapid termination. The growth is very sensitive to radiation either by X-rays or radium. The cervical secondaries differ from other malignancies in that location, in that it may be easily shelled-out, being encapsulated and not infiltrating neighbouring tissues.

Under the microscope, the lympho-epithelioma is seen to consist of large pale epithelial cells with granular cytoplasm and indistinct cell outline, forming syncitial cords with masses of lymphocytes between. The tumour is unusual in that the epithelial cells form the reticulated syncytium. Some few pathologists, including Broader, deny the existence of the tumour, calling it a basal-celled carcinoma.

## Royal College of Physicians and Surgeons of Canada.

DR. F. N. G. STARR, PRESIDENT.

In the days of long ago in Canada practically every doctor began life as a general practitioner. As practice developed he began to discover that he was more interested in one line than in another. As soon as his purse began to show signs of bulging, he would go abroad to do some intensive post-graduate study and practical work in his chosen speciality, returning to work as a "specialist."

In later years students have frequently decided during their college course what is to be their chosen line, whether fitted for it or not. Upon graduating they begin their future training for this special work by trying for a hospital post in some special course. Failing this, they proceed to some large clinic as onlookers for from two weeks to three months, endeavouring to learn "more and more about less and less."

The question of improving the state of affairs has been under consideration by the Canadian Medical Association for many years, culminating in the formation of the Royal College of Physicians and Surgeons in June, 1929, when the College received a Royal Charter.

It is proposed that the standard of examination for the College shall be of the highest, and that the diploma obtained will stand for the best that is to be found in medicine, surgery and its allied branches.

It is important that students should take the primary examination during their college course, when their anatomy and physiology are still fresh in their minds. Then when a few years later they have decided upon the line of work they intend to follow, they will be in a position to seek the diploma by taking the Final Examination. It is hoped that the various universities in the Dominion will arrange intensive courses of study in order to prepare their undergraduates, as well as their graduates, for these examinations.

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## Phosphate Metabolism.

By H. D. JENNER, B.A., '33.

The body contains about 700 g. of phosphorus and of this amount 600 g. occurs in the bones and 57 g. in the muscles. All the phosphorus of the body is in the form of orthophosphoric acid, some of it esterified with various organic radicles such as hexose, the rest as inorganic phosphate. Pyrophosphate appear to be present in muscle, probably in organic combination with adenylic acid (Lohman), but, since pyrophosphoric acid is really phosphoryl phosphate, it is not a true exception to the above statement.

### Inorganic Phosphate.

Sodium and potassium phosphates, in both monobasic and dibasic form, are found in all living cells and tissue fluids. Blood plasma contains 2.5 to 3.5 Mg. of Phosphorus in the inorganic form per 100 c.c. in adults and up to 5 Mg. per 100 c.c. in children. This, with the inorganic phosphate of the cells in rather smaller concentration, constitutes about 1/12 of the total blood phosphorus. About 95% of the urinary phosphate is inorganic and its concentration is greater than in the plasma. The mineral salts of bone are present probably as a basic calcium phosphate

$[Ca_3 (Po_4)_2]_6 Ca(OH)_2$, mixed or possibly combined with calcium carbonate (Klement, Morgulis). Body cells seem to possess only an adaptive or facultative permeability for phosphate ions.

### Organic Compounds — Lipins and Simple Phosphoric Esters.

These are distributed throughout all the tissue, but are more concentrated in certain regions. Nerve and liver tissues contain 300 to 400 Mg. of Phosphorus. in organic combination, per 100g.; the walls of the stomach and intestine, the lungs, blood vessels and muscles contain 100 to 200 Mg. per 100 g. (VanSlyke & Peters); whole human blood contains 30 to 40 Mg. per 100 c.c. and plasma 7 to 8 Mg. per 100 c.c. (Kay). These organic compounds can all be elaborated by the body from inorganic phosphate in the diet.

(a) Phospho-lipins or Phosphaties: These are compounds containing fatty acids, phosphoric acid and a nitrogenous base combined with a polyalcohol. This alcohol in lecithin and kephalin is glycerol. Sphingomyelin is the other important member of this group. Lecithin and kephalin are found in all living matter and must be regarded as essential parts of protoplasm. Sphingomyelin occurs chiefly in brain and nerve tissue. Kephalin is believed to be a necessary component of the blood-clotting mechanism. The phosphatide content of cellular organs remains sensibly constant even during starvation. The fatty acid part of the molecule is characteristic for a given organ in a given species. Especially in the presence of cholesterol, phosphatides tend to form stable colloidal solutions in water. They are easily oxidized and their affinity for water increases greatly during oxidation. These two latter properties may qualify them to act as the chief regulators of water transfer between cells and tissue fluids and also, from part to part in the intricate intracellular structure.

(b) Nucleic Acid and Nucleotides: These are component parts of nucleoproteins and are found in all living cells. They are especially abundant in glandular tissue.

(c) Phosphoproteins: These are proteins, such as casein, which contain a phosphate radicle; they are synthesized in the mammary gland during lactation, but are otherwise not found in the animal body.

(d) Hexosephosphates: These are esters formed by the linkage of orthophosphoric acid with a hydroxyl group of hexose. Hexose monophosphate is fairly definitely proven to exist in red cells and muscle. In red cells this or some similar compound forms about 1/3 of the organic phosphate. Blood plasma may also contain a minute amount. In muscle, hexose phosphate probably forms a necessary stage in glucose oxidation.

### Phosphatase.

In all the organs of the body containing acid soluble organic phosphates, there is found also a phosphoric esterase or phosphatase. This enzyme splits hexose phosphate and similar compounds into inorganic phosphate and a polyalcohol and also causes the reversal of this action with synthesis of phosphoric esters under suitable conditions. The mucosa of the duodenum and small intestine, the growing parts of young bone and the cortex of kidney contain the greatest amount. In the plasma it is present in very low concentrations. Cartilage contains none at all, but when ossification sets in, the enzyme makes its appearance in the region of preliminary calcification and its concentration is proportional to the rapidity of bone growth, reaching a maximum, in the long bones of the rat or rabbit foetus, before birth. In the kidney there is very little before birth, but it rises sharply during the first ten days of life to reach a steady maximum which persists throughout life. Bile contains a much greater amount than normal plasma. Neither in the kidney nor the intestine is the function definitely understood, although there is con-

siderable movement of phosphates through both of these tissues. The probable function in bone formation will be dealt with later. Also it probably plays a part, during carbohydrate oxidation, in the breakdown and resynthesis of hexosephosphate. Mammalian phosphatase works best in a medium of pH. 8.9 to 9.1 and its hydrolytic activity is greatly increased in the presence of Magnesium ions at concentrations of M/100 to M/10,000.

### Calcium as it Affects Phosphorus Metabolism.

It is impossible to deal adequately with the control of phosphate metabolism without considering the parallel changes of calcium. Normal human blood serum contains from 9 to 11 Mg. of calcium per 100 c.c. Red blood cells contain only minute traces. Muscle cells contain about 6.5 Mg. calcium per 100 g. and the distribution, in so far as figures are available and reliable, seems fairly even throughout the soft tissues. In the blood plasma the calcium present may be divided into three parts (Peters): First, the organic calcium compound of calcium protienate, which is non-diffusible and takes no part in maintaining the calcium ion concentration of blood plasma or tissue fluids and which varies with the protien concentration of the blood plasma (Hunter): Second, the "chemically" dissolved inorganic calcium, and third, the "biologically" dissolved inorganic calcium; this latter part represents the amount, over and above the "chemically" dissolved fraction, of inorganic calcium held in solution. Parathormone, in some unknown way markedly increases the solubility of inorganic calcium salts in the blood plasma and in this way may be largely responsible for the maintenance of the "biologically" dissolved fraction.

### Sources of Calcium and Phosphorus in the Diet.

Phosphorus is obtained from liver, milk, eggs and meat in the regular diet; also it may be obtained therapeutically as inorganic salts lecithin or glycerophosphates. The daily requirement is about 1 to 2 g. Calcium is found in milk, eggs and green vegetables, or may be added therapeutically as calcium chloride, gluconate, or lactate. Adults require 0.4 to 1.0 g. daily and children somewhat more.

### Absorption.

In both phosphate and calcium absorption the two most important factors are the supply in the diet and the presence of vitamin D. In some way not at present understood, vitamin D, whether contained in the diet or produced by exposure to ultra violet irradiation, is able to increase the absorption of both phosphate and calcium ions from the intestine. Indeed it is possible that this may be the only direct action of vitamin D. The third factor is the relative amounts of calcium and phosphorus in the diet, a large excess of either interfering with the absorption of the other. This is especially important when vitamin D is lacking, but is relatively unimportant when this is present in sufficient amounts. The fourth condition of importance is the reaction of the intestinal contents; acids increase the solubility of both calcium and phosphate ions and aid in their absorption while alkalies exert an opposite action. Excess of fatty acids in the intestine form insoluble soaps with calcium and set free phosphate ions, thus decreasing calcium absorption and possibly increasing phosphate uptake.

### Elimination.

Urinary excretion of both calcium and phosphate varies with the amount absorbed from the intestine and the concentration of the inorganic salts of each in the blood plasma. Acids or acidosis increase and alkalies decrease the urinary output of both calcium and phosphate. In man from 0.3 to 2 g. of phosphorus are excreted daily, depending on the intake. The urinary excre-

tion is approximately double the faecal output of phosphorus under normal conditions. The phosphorus in the faeces is chiefly in the form of the calcium and magnesium salts and probably represents unabsorbed phosphate. Any factor which increases absorption of phosphate also increases urinary excretion and decreases the faecal phosphate. This rule also holds good for calcium, although in this case there is active excretion through the colon which usually exceeds the urinary output. During starvation phosphate excretion is proportionately greater than that of other anions, necessitating ultimately some loss from the phosphate stores in bone.

### The Parathyroid Hormone.

As has already been stated, parathyroid secretion appears markedly to increase the solubility of calcium ions in the plasma. Administration of parathormone causes an increase in the inorganic calcium of the plasma and a simultaneous increase in the urinary excretion. This effect is more marked if the diet is rich in calcium, but even when the diet is deficient in calcium hypercalcaemia develops by reason of an increased decalcification of the spongy parts of the bony skeleton. This effect of parathyroid secretion on the metabolism of calcium has been recognized for some time, but not until more recently have the phosphate changes received special attention. Following parathormone administration the urinary excretion of phosphate increases abruptly and the inorganic phosphate concentration of plasma falls. The excess phosphate excreted is greater than that liberated by the calcium so that other phosphorus stores than bone are depleted. On further injection of parathyroid extract and increased hypercalcaemia, a point is reached where there is a sudden decrease in the urinary excretion and a corresponding rise in the phosphate concentration of the plasma; this is accompanied by an increase in the N. P. N. of the plasma. Collip found, following parthroïdectomy in rabbits, that the plasma phosphate rose without any change in the calcium concentration. These results indicate that the primary action of parathormone is on phosphate rather than on calcium metabolism (Hunter).

### Thyroxin.

Thyroxin increases the excretion of both calcium and phosphorus in the same proportions as they occur in bone suggesting bone resorption as the chief source. This effect is brought about without change in the calcium or phosphate of the plasma which may remain at normal level while as much as eight times the normal amount is excreted. The increased excretion of phosphate is through the kidneys, but calcium excretion is increased not only into the urine as in parathormone stimulation, but also into the colon. In hyperthyroidism the faecal calcium may be greater in amount than that contained in the diet (Hunter). In myxoedema the calcium excretion is much less than normal. In hypoparathyroid tetany thyroxin administration definitely raises the calcium concentration in plasma to about the normal level. The stimulation of calcium excretion and of decalcification has a long latent period after thyroxin is given and continues after the cessation of thyroxin administration longer than any other action of the thyroid yet described (Hunter).

### Control of Phosphate and Calcium Concentration in Plasma.

The concentrations of the inorganic salts of calcium and phosphorus in the plasma are to a certain degree reciprocal. An increase in either one causes a decrease in the other and, conversely, a decrease in either causes an increase in the other, providing that absorption is adequate. One of the most potent factors in controlling the concentrations of calcium and phosphate in the plasma is the parathyroid hormone; its action has

already been outlined. From a practical standpoint vitamin D is the most important. This is due to the fact that its action comes at the point where the metabolic chain is most often weak, namely at absorption from the intestine. It is not definitely known whether vitamin D does or does not exert a specific action in the regulation of the calcium and phosphate concentration of the plasma. Thyroxin, as stated above, usually has no effect on the plasma concentrations. Injections of glucose, adrenalin or insulin cause a temporary fall in the phosphate concentration of the plasma, while pituitrin raises it.

## Functions of Phosphates in the Body.

1. **Regulation of Acid-base Metabolism.**—In the blood, inorganic phosphates are of little consequence quantitatively due to their low concentration; but the phosphoric esters of the red cells may play a considerable part in neutrality regulation. In the tissue cells, phosphates play an important part which, due to lack of data on their true concentration, is not yet accurately assessed. Phosphatides, phosphocreatin and nucleic acids bind probably as much base as the cell proteins. They are fairly stable at the pH of the cells, so take little part as buffers, except during muscular contraction when phosphocreatin breaks down as described above and frees base to neutralize lactic acid.

In urine, phosphates are of prime importance as buffers and it is due to phosphate changes that it is possible for the kidney to secrete an acid urine. In the plasma only 1/5 of the inorganic phosphate is in the monobasic form while at pH 6, about the reaction of normal urine, this relationship is reversed and only 1/5 is present as dibasic phosphate. This means that for every 5 phosphate radicles excreted, 3 basic radicles are freed to maintain the alkali reserve of the blood. During acidosis a still more acid urine is excreted and practically all the phosphate in the urine is monobasic. The mechanism of this action in the kidney may be either a selective excretion of monobasic phosphate or a selective reabsorption of the dibasic salt.

**II. Phosphates in Carboyhdrate Metabolism:** Following a carbohydrate meal, intravenous injection of glucose or the administration of adrenalin or insulin there is a rapid removal of glucose from the blood and an accumulation in the tissues. Simultaneously there is a fall in the inorganic phosphate of plasma and in urinary excretion of phosphate. Some investigators have found an increase in the hexose phosphate content of muscles following insulin administration. This is taken as proof that glucose is absorbed from the bloodstream in combination with phosphate. It is also generally accepted now that a hexosephosphate forms a necessary intermediary step in the oxidation of glucose in the tissues.

**III. Phosphates in Fat Metabolism:**

The role of phosphates in fat metabolism is not well understood. By some it is believed that fatty acids are absorbed from the intestine as phosphatides in the mucosal cells. Phosphatides, being much more soluble than neutral fat, also act as the chief conveyors of fatty acid in the blood stream. During lactation the mammary gland secretes neutral fat which is believed by some investigators to arise, not from neutral fat in the blood plasma, but from the plasma phosphatides. In the combustion of fats phosphatides probably play a necessary part similar to that of hexosephosphate in carbohydrate oxidation.

**IV. Ossification:** This is one of the most important functions of calcium and phosphorus in the body. In order that ossification may proceed in a normal way there are two necessary conditions: (1) The plasma concentrations of either phosphate or calcium ions must not fall below a certain level and the product [Ca] x [$PO_4$] must also be maintained. The phosphate can fall

to a lower level if calcium is high than if both are low: (2) The local biological processes at the seat of bone formation, which result in calcium phosphate deposition, must be functioning properly.

The plasma and tissue fluids are, under normal conditions almost certainly in a state of effective saturation with calcium phosphate. The mechanism for the maintenance of this concentration has been discussed in previous sections. It is important to realize that it is at this point where the ossification process in children most often breaks down and that restoration of the normal concentrations of calcium and phosphate in the plasma is usually all that is necessary to insure normal calcification. With regard to the local biological processes at the seat of bone formation, the mechanism which comes in play here is still in doubt. It is not yet proven that vitamin D, parathormone or thyroxin has no specific action. Robinson and Kay believe that the following takes place: The osteoblasts secrete phosphatase which hydrolyses a small amount of the acid-soluble phosphoric esters of blood plasma and thus create locally a higher concentration of inorganic phosphate ions with resulting deposition of calcium phosphate. The presence of a phosphoric ester hydrolysed by phosphates has been demonstrated in the blood plasma The correlation between phosphatase concentration and rapidity of bone formation has already been referred to. A great deal of experimental work makes this mechanism look very probable The evidence is, of course, circumstantial and the scheme does not account for the deposition in bone of calcium carbonate

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## References.

1. Quanitative Clinical Chemistry—Van Slyke and Peters.
2. Recent Advances in Biochemistry—Pryde—3rd ed.
3. Physiological Chemistry—Matthews.
4. Hexosephosphoric Esters in Ossification.—Robinson, B.J.; 17, 286, 1923.
5. Phosphatase in Bone Formation.—Kay, Br. J. Exp. Path.—7, 177, 1926.
6. Blood Phosphates and Their Excretion.—Brian, Kay and Marshall, B.J.—22, 628, 1928.
7. Phosphatases of Mammalian Tissues—Kay, B.J.,—22, 855, 1928.
8. Magnesium and the Phosphatase System—Jenner & Kay; J.B.C.—93, 733, 1931.
9. Calcification—Peters; Am. Jour. of Surgery—Dec., 1930.
10. The Clinical Significance of Blood Phosphate—Byrom, The Lancet, Feb., 1930.
11. Metabolism of Calcium, Phosphorus and Parathyroids—D. Hunter; Quart. Jour. of Med., 24 Apr., 1931.

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# Some Common Ear, Nose and Throat Treatments.

By KENT HARRISON, M.D., '31.

Treatments of Epistaxis, External Otitis, Otitis Media, Acute Tonsillitis and Quinsy, Post Tonsillectomy treatment and Haemorrhage and of Vincent's Angina are briefly discussed.

## Epistaxis.

The commonest origin is from a plexus of loosely supported veins on the lower and anterior part of each surface of the septum. Other common areas are the inferior meatus and concha over which the mucous membrane resembles erectile tissue. These latter areas are supplied by the sphenopalatine branch of the Internal Maxillary Artery. After operations upon the inferior concha, such as Maxillary sinusotomy, haemorrhage is commonly from the inferior conchal branch of the sphenopalatine artery, the latter entering the nasal cavity just behind and above the posterior tip of the inferior concha. Any evident cause as a foreign body, or conditions as excess adenoid tissue in children or new growth in adults must be appropriately treated. The nasal cavity should be first cleared out in order to see the bleeding point, which is often impossible. The clots are picked and swabbed out, using angle forceps, and nasal speculum. If bleeding point is seen, hold cotton-covered applicator moist with adrenalin against it for a few minutes. If not successful, which is unusual, pack the nose.

If no bleeding point is seen, pack the nose. Use gauze plugs about the size and length of the little finger, just moist with hydrogen peroxide or 5% cocaine. Pack as high up and as far forwards as possible, straight back and along the inferior meatus, and then between these two. Pack as tightly as the patient allows.

If it appears that packing will be left in for more than 3 or 4 hours, it is best to cover the gauze with vaseline, as this makes its removal much less painful to the patient. Packing should not be left in over 48 hours and not more than 24 hours preferably, as there is danger of spread of infection up to meninges.

If the bleeding has been severe, have gauze ready to repack the nose if necessary when the old packing is removed.

Adrenalin shrinks the mucous membrane and vessels very well, but may be followed by a good deal of sneezing, local discharge and sometimes a general reaction when used on such a large area as that when the nose is packed.

## External Otitis.

(Furunculosis of External Aditory Canal).

The difficulty is to rule out otitis media and mastoiditis. Take temperature. If over 100° it is not usually due to a furuncle alone. Try the hearing. It is usually less than 6 feet for conversational voice in middle ear infection. Try hearing of both ears and enquire as to previous efficiency of hearing.

Clear out canal by cotton-covered applicator with previous syringing if necessary. This is the most important part of the examination, as upon its thoroughness depends the viewing of the tympanic membrane.

Sometimes patients must be observed in bed for several days before the diagnosis is certain. External otitis and otitis media may be present together.

**Treatment.**—If the furuncle is in the outer part of the canal and easily accessible, it is treated as those elsewhere. That is application of heat until pus has formed, as indicated by size, redness, tenderness and fluctuation, and then lancing. This lancing is very painful. Full strength carbolic acid or Bonane's solution applied to the fur-

uncle for 2 or 3 minutes helps decrease the pain. The wall of the furuncle is often 2 or 3 millimetres thick. The knife used for piercing the ear drum is useful for lancing.

After lancing, pack ear with tape and instil half strength Keith's dressing as below.

When the furuncle is not accessible the canal is cleaned out as much as possible and 10% silver nitrate applied to the canal wall by a cotton-covered metal applicator. This application may be repeated every day while the process is in the acute stage. After application of a silver nitrate the canal is packed with ¼ inch plain tape, using speculum and angle forceps. Put 3 or 4 drops of half strength Keith's dressing on this tape three times a day, or alcohol 50% or Boracic acid solution in the same quantities.

Change the packing every one or two days, depending upon the amount of discharge.

If the canal is too congested and swollen to pack, instil 3 drops of Boroglycerine (Boracic acid and glycerine) in ear three times a day. This softens the tissue and may allow packing in one or two days.

The tape acts as a wick carrying dressing to and discharge away from the inflamed area. A hot water bottle to the ear as often and as long as possible will shorten the duration of the inflammation. External otitis often takes 7 to 10 days to clear up, and may be very painful.

### Otitis Media.

When the middle ear is discharging the object of treatment is to provide good drainage.

Gently swab the canal out with hydrogen peroxide on a cotton-covered metal applicator. Then drop 3 or 4 drops of alcohol or solution No. 503 in the canal. Do this sufficiently often to keep the canal reasonably clear. Three times a day is usually sufficient. Hydrogen peroxide softens the exudate.

If the canal is excoriated, stronger than 50% alcohol is painful. Do not plug the canal with cotton; a little may be placed in the concha to collect the discharge. Alcohol or 503 solution probably lessens viscosity more than does Keith's dressing.

In the acute stage with a fever the patient is put to bed and a hot water bottle applied to the ear continuously or intermittently.

In any otitis media case watch for complications such as significant mastoid and labarynthine involvement and intracranial complications such as brain abscess, septic thrombosis of lateral blood sinus or of internal jugular vein and meningitis.

Solution 503 contains boracic acid, glycerine, liquor hydrargyri bichloride 1 in 1,000, and about 40% alcohol.

### Acute Tonsillitis and Quinsy.

The patient is put to bed to procure rest and isolated to prevent infection of other patients. The patient is kept in bed until throat approximates normal and pulse and temperature are normal. A fluid diet and as much to drink as possible are given to keep up the general health and increase the excretion of toxins. An ounce of magnesium sulphate every morning encourages the latter.

Aspirin and sodium bicarbonate of each 10 grains every 3 hours are given to decrease the pain and perhaps help control the infection. The sodium bicarbonate counteracts the tendency of aspirin to produce disturbance of digestion.

Locally, hot normal saline irrigations are given every 2 hours throughout the day and during the night if sufficient relief is obtained to warrant it. A hot water bottle around the neck may relieve pain and shortens the length of the infective process. 40% argyrol painted on the throat morning and night eases the local irritation.

The Quinsy abscess is incised as soon as it has formed, usually in 3 or 4 days. "The point of entry in the

palate should be above a horizontal line drawn through the base of the uvula and external to a vertical line along the anterior pillar of the fauces. A long pair of bayonet-shaped sinus forceps is pushed suddenly and forcibly backwards into the abscess to a depth of an inch or so, and immediately opened widely so as to evacuate the pus freely." (A. Logan Turner). A knife with a blade about an inch long may also be used. No anaesthetic is required.

Acute tonsillitis usually takes 8 to 10 days to become quiescent.

### Post Tonsillectomy Treatment.

After a local anaesthetic the patient sits up in bed with a back rest and ice collar. The patient, being conscious, will usually appreciate tonsillar bleeding by repeated swallowing or coughing. The sitting position and ice collar help reduce congestion and so bleeding.

After a general anaesthetic have the patient lying down on side with face turned on same side and ice-collar to neck. This favours the drainage of blood from the mouth rather than its aspiration into the lungs. When patient becomes conscious, have him in sitting position as after local anaesthetic.

Unnecessary throat clearing and talking are discouraged, as they are apt to start bleeding in the first few hours.

Swallowing is very painful for first 24 hours, but water may be given when wanted. A small piece of ice to suck or moistening of the lips help relieve the dryness of the mouth. Medication is given most easily hypodermically, but pills may be dissolved under tongue or in water before swallowing.

Warm aspirin gargle or normal saline throat irrigation may be given every 4 hours starting the day after operation. The aspirin or saline gargle is well continued until the throat is healed, as they keep it clean and decrease the odour.

Argyrol, 40%, applied to the throat reduces odour and local irritation. Temperature, pulse and respiration are taken twice daily. A fluid diet is given for first 3 or 4 days, which is gradually replaced by soft and normal diet in a week. A purgative is given the day after operation, and bowels are kept open daily henceforth.

The white slough in the tonsillar region usually disappears in about 10 to 14 days. It may produce a foul odour which is well controlled by 40% argyrol applied two or three times a day.

The earliest going home is on the second day, and on an average the third day after operation. No heavy work should be done for two weeks after the operation.

Pain in tonsillar area 2 - 4 days after tonsillectomy, with perhaps a little fever, is often due to a stitch abscess in the fossa. The stitch is removed at once, and stitches are usually removed in three or four days whether or not an abscess is present.

Earache after tonsillectomy sometimes occurs. Middle ear and external canal infection are first ruled out by auroscopic examination. The earache is then a referred pain phenomenon originating in the tonsillar fossa area, and may occur immediately after the operation and last three or four days.

The pain is controlled by codeia. There is no specific treatment, and Keith's dressing in the canal is of no use.

Aspirin gargle is made by adding aspirin grains x to half a glass of hot water. A good throat irrigating solution is sodium chloride and sodium bicarbonate of each 1 drachm to a quart of warm water. Normal saline solution is a teaspoonful of salt to a pint of water.

### Post Tonsillectomy Haemorrhage.

This is indicated by the continuous expectoration of fresh blood after tonsillectomy. Haemorrhage from nose, lungs and gastrointestinal tract is eliminated.

Have patient sitting up in bed with a back rest and ice collar, and use a drop light for examination.

Pick and sponge away clots in the fossa with tonsil haemostats, and sponge forceps. The clot is often quite firm, and may feel like tissue, but is of a darker color.

Examine both fossae and nasopharynx. Use pillar retractors and tongue depressor. The uvula may be torn and bleeding. The tonsillar bleeding is usually an oozing from a small area, but may be from a spurting artery.

Pick away tags of tissue, which may be the source of the bleeding.

Apply dry gauze swabs to bleeding fossa with sponge forceps. Very light pressure only is required to stop the bleeding. The patient rests by closing mouth on the forceps.

If the dry swabs are not successful in 10 minutes, add adrenalin or hydrogen peroxide to the swabs for 10 minutes. Talcum powder added to the dry swabs sometimes aids clotting.

If the above is not successful and the bleeding is oozing rather than a spurting character, the area may be cauterized by 75% silver nitrate. First apply adrenalin and 10% cocaine equal parts, or 10% cocaine to the fossa for five minutes. Have an assistant to hold, with a pillar retractor, the anterior pillar forward and laterally to procure a clear view of the fossa. Just cover a metal applicator with cotton, and, often wetting it with the silver nitrate. press off the excess against the tray side. Touch up the bleeding area with the silver nitrate. Its cauterizing action is seen by the whitening of the tissue immediately after its application. Be careful not to touch unnecessary spots or to let silver nitrate drop elsewhere.

If the bleeding is from a spurting vessel and is not stopped by pressure in twenty minutes or so, anaesthetise the area as above. Then grasp bleeding vessel or area with the mouse-tooth forceps and clamp off the base of the grasped tissue with a tonsil haemostat, afterwards removing the mouse-tooth forceps. On removal of the tonsil haemostat in five minutes the bleeding is almost always stopped, or soon yields to pressure or cauterization.

The next step would be to ligature the bleeding area after clamping it off with mouse-tooth forceps, but this is very seldom necessary.

When there is much bleeding silver nitrate is dangerous, as it may spread widely with the blood.

While stopping the haemorrhage, and for an hour or so afterwards, the patient should not be allowed to drink. Put a wet piece of gauze to the lips or over forehead.

After stopping haemorrhage examine both fossae again in 10 minutes; if there is no fresh bleeding, morphia ¼ grain hypodermically may be given to quiet the patient and reduce pulse rate. If the patient is much excited, morphia ¼ grain hypodermically may be given the patient while stopping the bleeding. Codeia grain i as required is the best sedative after tonsillectomy, as it decreases the cough reflex less than morphia.

### Vincent's Angina.

Of first importance is general cleanliness of the mouth. Diseased teeth are removed or repaired. Teeth are brushed three times a day. Sodium perborate drachms ii to a glass of water, or Bowman's solution drachm i are used as mouth washes three times a day.

### Reference.

Diseases of the Nose, Throat and Ear. — A. Logan Turner.

# Bright's Disease.

## II. CLINICAL COURSE, SYMPTOMATOLOGY, AND KIDNEY FUNCTION TESTS.

By F. S. BRIEN, B.A., '33; W. J. HENDRY, B.A., '33; R. B. KERR, B.A., '33.

The classification suggested in Part I. of this series, presented the various kidney lesions encountered in Bright's Disease at post mortem. However, even though this classification does much to correlate clinical observations with pathological findings it is well to extend it so that it will be of greater assistance from the standpoint of clinical study and prognosis. Therefore, as a practical clinical classification, the following is suggested:

A. Nephrosis—degenerative lesions.
B. Nephritis—inflammatory lesions —focal or diffuse.
1. Simple acute.
2. Subacute.
3. Subchronic; (a) Efficiency. (b) Insufficiency.
4. Chronic.
5. Combined or Malignant.

### CLINICAL COURSE AND SYMPTOMATOLOGY.

**A. Nephrosis.**—The term nephrosis has in the past been used rather loosely, more from a pathological standpoint than from a clinical one. However, there is a definite clinical picture accompanying degenerative changes which are limited to the kidney tubules. The picture of nephrosis may result from one of many causes, all of which are toxic in nature.

The characteristics of this condition are as follows:

(1) General Findings: marked oedema, effusion into serous cavities, normal blood pressure, occasional diarrhoea, low metabolic rate.

(2) Urinary Findings: decreased output, high specific gravity, marked albuminuria, abundant granular and hyaline casts, no haematuria.

(3) Blood Findings: moderate anaemia, great increase in cholesterol, low serum protein, normal N.P.N.

The patient suffering from a pure degeneration of the kidney tubules, commonly recovers completely. However, such a patient is very susceptible to secondary infection and often succumbs as a result of the condition.

**B. Nephritis.**—It is essential that one appreciate the progressive nature of nephritis and that the various stages of the lesion cannot be differentiated with exactitude during the course of the disease. Most cases of nephritis show a well-marked acute stage, however, in some instances the symptoms of the acute stage are so mild that they are overlooked and the patient may present himself with manifestations of an advanced kidney lesion.

#### (1) *Simple Acute Stage.*

Ten days to three weeks after an acute upper respiratory infection, or 24 to 48 hours after exposure to cold, a clinical picture with symptoms referrable to the kidney may develop, with a sudden onset. The manifestations of acute nephritis are as follows:

(1) General Findings: chills, fever, malaise, pain in the back, headache, nausea and vomiting, convulsive phenomena. Blood pressure—moderately raised, usually 150-170 mm., rarely as high as 180 mm. Oedema—commonly in the face, but may occur elsewhere.

(2) Urinary Findings: haematuria —usually gross (smoky urine), but may be only microscopic; oliguria (even to anuria); albuminuria; pus cells; casts—especially blood, later brown granular; specific gravity high—usually above 1020.

(3) Blood Findings: N. P. N. moderately raised—not over 100 mgms.;

plasma protein diminished in some cases; anaemia may be present.

(4) Renal Function: Varying degrees of loss of all functions of the kidney.

It must be understood that the above picture may vary considerably, with haematuria, albuminuria, casts, and oedema as constant findings.

The acute stage may have one of five possible outcomes, as follows:

(1) The patient may completely recover — signs and symptoms often disappear in from four to eight weeks.

(2) The clinical and urinary findings of the acute stage may continue with varying degrees of severity for a considerable period of time. Such cases constitute the so-called "stormy" or sub-acute stage of nephritis. They usually end fatally in uraemia in from six months to three years.

(3) The acute stage may subside, leaving the patient free of symptoms. However, signs of kidney damage of mild degree and some slight impairment of renal function are present. Such a condition may be termed the sub-chronic stage with efficiency.

(4) The acute stage may progress into the sub-chronic stage with insufficiency of renal function, characterized by failure of concentration, slight oedema and occasional nycturia.

(5) Very rarely the condition may pass rapidly into the terminal or chronic state to terminate in uraemia and death.

(2) *Subacute Stage.*

The symptomatology is the same as that indicated for the acute stage. However, the condition frequently shows early subsidence only to recur in a more or less violent form, to be followed by irregular exacerbations characterized by bouts of fever, varying degrees of haematuria, oliguria and albuminuria, with casts of all varieties except waxy. The systolic blood pressure seldom reaches normal and frequently fluctuates at values around 150 mm. of mercury. Oedema in varying degrees is constantly present. Usually progressive failure of kidney function occurs to terminate in uraemia and death.

(3) *Subchronic Stage With Efficiency of Kidney Function:*

The patient is subjectively well, but albuminuria, granular or hyaline casts and diminished urea clearance show that the kidney has not completely returned to normal. As a rule the blood pressure is normal. Anaemia is slight or absent.

The following fates may overtake the subchronic nephritic with efficiency:

(a) The patient may remain in this latent stage for many years (commonly discovered during insurance or other routine examinations).

(b) Signs of kidney damage may disappear with apparently complete recovery. This may be considered an inadequately treated Acute Stage.

(c) An acute exacerbation may occur, adding a typical picture of simple acute nephritis to the more chronic lesion. Such a condition accelerates progress toward renal failure.

(d) For no apparent reason the case may progress into the insufficient stage of subchronic nephritis and thence into the chronic stage with uraemia and death.

(4) *Subchronic Stage with Insufficiency of Kidney Function:*

This condition is characterized by:

(1) General symptoms: patient is ill and undernourished, oedema is present unless the patient is under strict regime, blood pressure is usually raised—150 mm. of mercury.

(2) Urinary findings: Nycturia, occasional microscopic haematuria, albuminuria, casts, and white blood cells.

(3) Blood findings: Moderate anaemia, low plasma protein if oedema be present; N.P.N.—moderately raised.

This stage, except in very rare instances, terminates fatally in less than three years, but with careful management may carry on for a somewhat longer period.

(5) *Chronic Stage*:

Characteristics of this stage are as follows:

(1) General findings: Cachexia, loss of subcutaneous fat, muscular weakness, tiredness, tendency for hair to fall out, uraemia, blood pressure 170-200 mm., oedema not commonly present unless due to cardiac insufficiency.

(2) Urinary findings: Obligatory polyuria, micturition as frequent by night as by day, albumin slight, occasional haematuria, casts present—hyaline, granular and fatty, white blood cells, epithelial cells. Specific gravity low—1006-1015.

(3) Blood findings: Anaemia, plasma protein—normal; N.P.N.—high, up to 300 mgms., if the patient's nitrogen compensating mechanism fails; indican high; creatinine—high.

(4) Retinal Changes: When these develop in cases of chronic nephritis an advanced stage of renal insufficiency is present. Their presence usually indicates that death will occur in from one to two years. Due to anaemia, the disc is paler than normal, as is the fundus. Dense white snow banks often surround the disc or appear elsewhere in the fundus. When they are absorbed, fine white dots are left on the retina. In the macular region these tend to be arranged in a star-shaped or fan-like manner. Flame-shaped haemorrhages occur in the nerve fibre layer, along with exudate and haemorrhage in the deeper layers of the retina. Later varying degrees of chorioretinitis and depigmentation appear.

(5) Kidney function: Tests show that there is a marked reduction in kidney function.

(a) Two-hour test—Increase of night urine, low maximal and fairly fixed specific gravity of urine, no increase in amount following intake of fluids because the kidney is always excreting at its maximal value.

(b) Concentration test: Failure of concentration above a specific gravity of 1015-1017—usually less.

(c) Water test: There is not the normal variation in volume of the specimens. The additional water is excreted over a long period of time. The specific gravity is fixed.

(d) Phenolsulphonephthalein test: Excretion of the dye is delayed.

(e) Urea Clearance test: Urea clearance is markedly reduced, usually below 25%.

**Uraemia**:—The clinical entity known as true chronic uraemia supervenes in cases of chronic nephritis, in which there has been progressive degeneration of the kidney structure to a stage which prevents adequate nitrogen excretion. The onset of this condition is insidious, symptoms developing gradually as the N.P.N. exceeds 100 mgms. per 100 cc. of blood. The clinical picture may be summarized briefly as follows:

1. Nervous Manifestations: Insomnia, headache, muscle twitchings, hiccoughs, delirium, convulsions, local palsies, coma.
2. Gastro-intestinal: Anorexia, nausea and vomiting, vomitus containing urea, dry mouth, thirst, halitosis (due to decomposition of urea), cramps, diarrhoea, haemorrhage from the bowels and kidney.
3. Respiratory: Noisy and stridulous dyspnoea, Cheyne-Stokes breathing.
4. Skin: Pruritus, eczema, or other skin rashes; purpura (haemorrhage into muscle also occurs).

**Malignant or Combined Nephritis.**—The urinary findings in any type of nephritis only reflect the changes in the glomeruli and tubules. Of the condition of the interstitial tissue and small vessels lying therein, we know very little from a clinical standpoint. However, there is a clinical picture — the so-called malignant hypertension, arteriolar sclerosis or Volhard's combined nephritis — in which the arterioles of the kidney are the important centres of the kidney lesion, being involved in an obliterative process; the other structures of the kidney, however, show involvement to a minor degree. The signs

and symptoms are very similar to those of chronic nephritis (which may progress rapidly to renal falure), to which is added a vascular manifestation — a very definite hypertension showing raised systolic and diastolic blood pressures, yet without much demonstrable cardiac hypertrophy. Death may be due to uraemia, heart failure or cerebral accident.

If the fundi are examined the arteries are seen to be strongly contracted. Arteriosclerosis is always a marked feature. At first papillary hyperaemia and mild oedema with a few peripapillary cotton wool exudates and haemorrhages are present. As the disease process becomes more severe the area of serious peripapillary oedema extends outwards involving the macula. Cotton wool exudates are still seen. Later, the hyperaemia of the disc fades, the oedematous area recedes from the periphery, punctate exudates appear, and a fine macular star develops. The vascular sclerosis becomes more marked, the perivasculitis makes its appearance. This is denoted by the silver wire artery and the white lines beside the blood column of both artery and vein. If the patient lives long enough, secondary optic atrophy, macular star, punctate exudates, a few haemorrhages and marked retinal arteriosclerosis and chorio-retinitis make their appearance.

## KIDNEY FUNCTION TESTS.

The purposes of kidney function tests are as follows:

(1) To ascertain the reaction of the kidney to normal stimulation, and to measure the conditions under which the patient is living at the moment—two hour test and the urea clearance test.

(2) To ascertain the response of the kidney to excessive physiological stimulation—i.e., the kidney's reserve—water test, concentration test, and urea concentration test.

(3) To ascertain the response of the kidney to the excretion of foreign substances — indigo carmine test, and the phenolsulphonephthalein test.

### 1. Two Hour Test:

Throughout the performance of this test the patient's usual routine of diet is maintained, with the following exceptions: (1) no solid food or fluid is taken between meals or during the night; (2) no added salt. Thus the fluid intake is about 1,760 cc., the nitrogen intake is 14 gms., and the salt intake 8.5 gms. On the day of the test the patient's bladder is emptied at 8.00 a.m. and the specimen discarded. He then has his ordinary breakfast. Specimens are collected every 2 hours until 8.00 p.m. The mid-day and evening meals are eaten at 12 noon and 5.00 p.m. respectively — at the latter hour to allow a period of three hours to elapse before the last specimens of day urine is collected. The night urine—from 8.00 p.m. to 8.00 a.m.—is collected as any day specimen.

The volume of each specimen is measured and its specific gravity noted. All readings should be made at the same temperature, or suitable corrections applied. The test as described is really that of Mosenthal. In the T.G.H. it is the practice to carry out the test in the manner described, except that no change is made in the dietary of the patient, whether he be receiving less than 1,760 cc. of fluid or less than 8.5 gms. of salt or 14 gms. of nitrogen.

The normal kidney shows a variability of function. In the specimens closely after a meal the water of that meal is excreted, hence their volume is high and their specific gravity low. Later there is a diminished excretion of water and an increased excretion of salt, hence the volume is low and the specific gravity high. Most of the nitrogen excretion takes place in the night urine, as well as salt which has not been excreted earlier in the day specimens. Most of the fluid excretion has occurred already, hence the urine has a high specific gravity, and a volume which is not usually much greater than one-third that of the total day output. There should be a variation of ten points in specific gravity between the

various specimens, and the output of nitrogen and salt should approximate the intake of those substances.

As indications of impaired renal function, one or more of the following changes may be noted:

(1) Nocturnal polyuria. The volume of the night urine is in excess of 750 cc. This is usually one of the first and most definite evidences of decreased kidney function. With a volume of from 500-750 ccs. one is suspicious of renal impairment.

(2) Low maximal specific gravity of day urine. The highest of the two hour specimens falls below 1018.

(3) Fixation of specific gravity. This is a very important sign of renal insufficiency. In marked cases the difference between the highest and lowest specific gravities may be only one or two points. The level of fixation generally becomes lower as functional impairment increases and the concentrating power of the kidney diminishes. There may be a pseudo-fixation in a patient who is on a restricted diet, e.g. 800 cc. of milk. Fixation in the middle range (1024-1018) may be of myocardial origin.

### 2. Concentration Test.

This test is designed to ascertain if the kidney can excrete salt and nitrogen with little water. The diet is similar to that in the two hour test, except that no water or other fluid is included. Urine is collected as in the two hour test, the specific gravity and volume determined as for that test. On a dry diet the normal kidney should be able to produce a urine with a specific gravity of 1030 or higher, in about 12 hours.

### 3. Water Test.

The patient is directed to omit breakfast. At 8.00 a.m. the bladder is emptied and the specimen discarded. Within a period of 20 min. the patient drinks 1,500 ccs. water. At half hour intervals from 8.30 a.m.—12.00 noon, the urine is collected. If desired the urine may be collected at two-hour intervals from noon until 8.00 p.m., and then in a separate container from 8.00 p.m.—8.00 a.m.

This test should never be performed on a person who has malignant hypertension, oedema or prostatic hypertrophy, unless a retention catheter be inserted.

Normally the whole of the ingested fluid is excreted within the 4-hour period, and the specific gravity approaches unity. In kidney insufficiency, there is a lag in this excretion, and very little of the excess fluid is excreted in the four hours, but appears in the afternoon and night specimens.

### 4. Urea Concentration Test.

This test illustrates the power of the kidney to excrete urea when a maximum amount has been placed in the blood. After 7.00 p.m. of the previous day no food or fluids have been taken. At 9.00 a.m. the bladder is emptied and the specimen is discarded, 15 gms. of urea dissolved in 125 cc. water are then taken. The urine is collected at hourly intervals — 10.00 and 11.00 a.m. If so desired a sample of blood may be taken at the same time and a urea determination is done upon it. The urinary specimens are measured and urea determination made.

Normally, at least 1.5% urea should be present in the urine. The 11.00 a.m. specimen should contain 2%. The ratio between the percentage of urea in the urine and in the blood should be as 1:2.

### 5. Phenolsulphonephthalein Excretion Test.

Ureteral catheters are inserted, 300 c.c. water are given per os, and 20. min. later 6 mgms. of the dye, dissolved in 1 cc. of sterile water are given intravenously. The urine is collected in tubes containing dilute potassium hydroxide solution. The time of the dye's appearance is noted. The urine is collected in half-hour samples for two hours, and at the end of that time for an additional period equal to the time dye in the urine, i.e., the urine contain-

ing dye is collected for a two hour period. The amount of dye stuff excreted is then estimated by measuring the samples and adding a 25% solution of sodium hydroxide until a red color is obtained. The standard is prepared by dissolving 3 mgms. of the dye in 1cc. of water and adding sodium hydroxide to this solution. Both standard and samples are made up to 1 litre and compared colorimetrically.

The dye should appear in 2-3 min., at the end of 30 min. 40-50% should be excreted, and at the end of two hours 75%. When information from the individual kidney is not required it is only necessary to insert a catheter into the bladder and allow the urine to flow into a beaker containing 2 drops of 25% potassium hydroxide. This makes the test more valuable to the general practitioner.

### 6. Urea Clearance Test.

This is a recently developed test, that is particularly valuable from a standpoint of treatment and prognosis. In 1930 Van Slyke and his co-workers presented data to show that the urea excreting ability of the kidneys was the most sensitive indicator of the state of renal function, of the several tests which he investigated. To determine the urea excreting ability determination must be made both of the blood urea concentration and on the urea concentration in the urine. The most satisfactory way to express this relation is by introducing the term "blood urea clearance," by which was meant "the number of cc. of blood per minute cleared of urea."

It has been found that a maximal amount of urea excretion occurs with a urinary output of 2 ccs. per minute and upward. Below 2 cc. per minute the urea excretion diminishes with the urinary output. Hence 2 ccs. per minute is known as the augmentation limit — that is to say, up to this point increasing the urinary volume increases the urea output. Above this point the urea clearance is dependent only upon the concentration of urea in the blood stream. This forms the basis of the urea clearance test.

Normally the kidneys can clear the urea from 75 c.c. of blood no matter what the blood urea concentration is, provided the urinary output is 2 cc. per minute or greater. This figure is called the maximum normal clearance.

**Technique**:—The patient may have a light breakfast at 7.00 a.m. No coffee or other diuretic should be taken. At 9.00 a.m. the patient takes 200 cc. water and empties the bladder, the specimen being discarded. At 9.50 a.m. a blood sample is withdrawn. At 10.00 a.m. the urine is collected and the specimen saved, and an additional 200 cc. water are taken. At 11.00 a.m. the urine is collected again. The volume of each specimen is measured and the urea concentration in mgms. is determined. The concentration of the sample of blood is also estimated. Throughout the test the patient should be quietly resting in bed.

By definition the urea clearance is the number of c.c. of blood per minute cleared of urea by renal excretion. This figure will be obtained by dividing the output of urea in the urine per minute by the amount of urea in 1 cc. of blood.

Let V=urinary output in cc. per min.
U=mgm. of urea per 100 cc. urine.
B=mgm. of urea per 100 cc. blood.

Now, the output of urea in the urine per minute is

$$\frac{U}{100} \times V.$$

and, the amount of urea in 1 cc. blood is

$$\frac{B}{100} \text{mgms.}$$

Hence, the blood urea clearance is—

$$\frac{U}{100} \times V \div \frac{B}{100}$$

$$\text{or } \frac{U}{100} \times V \times \frac{100}{B}$$

$$\text{or } \frac{U\ V}{B} = C_m = 75 \text{ normally (range 50-90)}$$

This relation is only maintained when the urinary output is greater than

2 c.c. per minute — in the polyuria of nephritis, diabetes mellitus and diabetes insipidus.

The relationship is not as simple as that indicated above where the urinary output is less than the augmentation limit. Halving the urinary output does not lower the urea excretion by a similar amount. It is found, experimentally, that the urinary urea excretion varies as the square root of the volume of urinary output. Hence, when the urinary output has decreased to a quarter the urea excretion has dropped to one half.

Hence the blood urea clearance becomes:—

$\frac{U}{B}\sqrt{V}=C_s$ = Standard normal clearance = 54 mgms. (range 35-70).

The value of the test lies in dealing with glomerular nephritis where in the acute stage the urea clearance may drop to as low as 23% of the normal value. Within three to four months the value rises to normal, if the patient is going to recover. Otherwise it offers a poor prognosis. At 5% of normal the patient is in imminent danger of uraemic coma.

## REFERENCES.

Addis, T., and Oliver, J. "The Renal Lesion in Bright's Disease."
Campbell, W. R. C.M.A.J. 1929, 20, 137.
Campbell, W. R. Lectures to Fifth Year, 1930-31.
Campbell, W. R. C.M.A.J. 1929, 21, 530.
Graham, D. A. L. C.M.A.J. 1929-30, 20, 144.
Harding and Urquhart. Lectures to Fifth Year. 1931-32.
Hawk and Bergeim. "Practical Physiological Chemistry."
Hutchison, H. S. C.M.A.J. 1929, 20, 133.
Osler. "Principles and Practice of Medicine."
Robertson. U. of T. M.J. 1928, 6, 1.
Todd and Sandford. "Clinical Diagnosis by Laboratory Methods."
Van Slyke et al. "Studies in Bright's Disease."

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(To be Continued.)

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# Lead Poisoning—Occurrence and Control.

By K. K. JACKSON, '36, B. and M.

Lead poisoning is one of the few ailments endangering human life which can be successfully treated directly from a fundamental knowledge of physiology and bio-chemistry. The principal object in this paper is, therefore, to outline roughly the above fundamentals which underlie modern clinical methods in the treatment of lead poisoning.

## Historical Review.

Lead poisoning has been known to exist even in ancient times. Hippocrates (370 B.C.) was probably the first physician to recognize that lead was the cause of the severe colic observed in a man who extracted metals. Dioscorides is quoted by Alderson as saying that "the drinking of litharge (red lead) causes oppression to the stomach, belly and intestines, with intense wringing pains; sometimes it even wounds the intestines by its severe pressure; it suppresses the urine, while the body swells and acquires an unsightly leaden hue."

Crato (1600 A.D.) attributed the colic which occurred in Moravia to the use of "falsified" wine, i.e., the adding of metallic lead or lead acetate to green wine in order to render the harsh acid taste less disagreeable.

The first experimental study of the disease was started in 1814 by Orfila, who examined the toxicity of lead when administered intravenously and orally. Since then a great many investigations have been carried out. The results of some of these will be outlined below.

### Occurrence.

Lead intoxication is not only the most common industrial poisoning, but also is derived from such diverse non-industrial sources as cosmetics and drugs, water supplies and home-made beverages.

In smelting and refining lead there is a high rate of lead poisoning in the United States. According to the Bureau of Labor statistics in 1913, during that year there were at least 1770 cases in 19 plants employing 7,500 men or about 23.6 per 100. It is interesting to compare these figures with the British rate for 1912, which was only 1.8 per 100.

Interviews with 167 smelter men suffering from lead poisoning showed that the majority had become intoxicated after a short exposure. Eighteen of the men had been employed less than one month, 121 less than 6 months, 132 less than a year, and only 35 had worked more than a year, 5 of whom had worked more than 5 years.

The poisoning is caused chiefly by the presence of finely divided lead compounds, mostly oxides, which come from the furnaces as fumes or as fine dust from the flues of the slag-houses.

The painter's trade in every country has been under less control than any other lead trade, and it is one in which there is least improvement in the rate of lead poisoning. A new danger that has appeared in painting is in connection with the "spray gun" which is used very commonly to-day. The experiments of Sharpe of Toronto have shown that in such work the lead content of the air may go far beyond the limit of safety even if the ordinary respirator is used.

### Entrance Into the Box.

There are three main portals through which lead may enter the body. (1) the respiratory tract; (2) gastro-intestinal tract; and (3) the skin.

Probably the most dangerous of the three is through the respiratory tract. Finally divided lead compounds enter the lungs and are absorbed and carried directly into the blood stream. This absorption is about ten times as rapid as gastro-intestinal absorption. Hence the exposure to be most guarded against is the inhalation of lead in the form of dust or fumes

Next in danger comes the continued ingestion of lead compounds. Gastric and pancreatic juices have the power to dissolve comparatively insoluble lead compounds, thus changing them into a form for absorption. However, not all the lead taken into the body is absorbed, but some remains unchanged and is excreted in the faeces.

The presence of food and milk in the gastro-intestinal tract is generally supposed to decrease greatly the rate of lead absorption. This theory is based on the arguments that the absorption is retarded in the presence of decreased acidity and that food itself unites with lead to form insoluble compounds. Hence milk especially is used as a mild preventative of lead poisoning.

Cutaneous absorption of lead is very slow and is relatively unimportant. The lead compounds which are soluble in blood serum enter into the general circulation as shown in the case of the lungs, but so slowly that no toxic symptoms develop.

To understand the mechanism of the transportation of lead in the body we must first have a knowledge of the behavior of lead and its compounds.

Lead enters the body either as an insoluble salt, oxide or in the metallic form. Those compounds especially in the oxide form and metallic form are surprisingly soluble in blood serum containing $CO_2$.

The two lead compounds formed in the body which are of physiological importance are tri-lead orthophosphate and di-lead hydrogen phosphate. When lead enters the normal circulation, tri-lead phosphate is formed. This salt is relatively insoluble (0.13 mgm. per 1 $HO^2$) and stable at the normal hydrogen ion concentration of the body, but

is sensitive to slight changes in acidity or alkalinity such as are produced in uncompensated acidosis, alkalosis or local production of acid. In this acid or alkaline medium it readily transforms into the more soluble di-lead salt (12.9 mgm. per I $H_2O$). Hence the transformation of tri-lead phosphate into di-lead phosphate is governed by conditions in the body and may have an important bearing upon the health of the individual. Indeed, this may account for the fact that lead may be stored in the body for years without causing any trouble until such influences as deficient diet or acute infection alter the reaction of the tissues and increase the amount of soluble lead in the body.

Experiments by Aub have shown quite conclusively that lead can hardly be present in the blood stream except as a phosphate and that it is carried in the colloidal form. He also showed that 80% of this was contained in the plasma and only 20% in the red blood cells.

When circulating lead comes in contact with the organic matrix of bone it is doubtless deposited there much as is calcium, except that it can be deposited in any quantity only as inert tri-lead phosphate. However, it does not unite directly with the protein of organic matrix, but replaces its calcium in the bone, so that as lead is absorbed calcium is liberated. Now, lead is known to have properties similar to calcium in that the same factors which favor the deposition of calcium in bone, such as high calcium diet, vitamin D, normal alkalinity of the blood and tissues, etc., favor the deposition of lead in bone. The degree of deposition of lead by bone depends on the hydrogen ion concentration.

Data therefore indicate that lead is slowly deposited in bone as tri-lead phosphate replacing calcium. When deposited, this is very inert and insoluble under normal conditions; but changes in the reaction of the tissues, either to the alkaline or acid side, allow it to be gradually changed into di-lead phosphate which, as we have mentioned above, is 100 times more soluble.

## Excretion of Lead.

There are three paths of excretion of lead. (a) alimentary canal, (b) the kidney, (c)) the skin.

It has long been known that the gastro-intestinal tract formed an important path for the excretion of lead. As early as 1839 Devergie in collaboration with Tanquerel des Planches definitely detected lead in the faeces. Even though this is recognized there are still many features of the mechanism which are but little understood. There is general belief now that the entire alimentary tract excretes as well as absorbes lead. Experiments performed by Brady and others have confirmed this belief and have found that excretion of lead in the bile is an important factor as well, although the chief route of excretion is by means of the gastro-intestinal tract. It has been pointed out by Oliver, Legge and Goadby that probably only a small percentage of lead ingested is absorbed, and the remainder passes out of the body unchanged.

Only a small amount of lead is excreted in the urine and its detection then is used as a diagnostic feature of lead poisoning and gives direct evidence that lead has been in the tissues. An analogy certainly seems to exist between the excretion of lead and calcium. It has often been observed that a high phosphate diet tends to increase the proportion of calcium in faeces while ingestion of hydrochloric acid increases the urinary output of calcium. A possible explanation may be found in the relative solubility of the compounds formed. Thus calcium chloride, a soluble salt, appears in the urine while calcium phosphate, an insoluble salt appears in the faeces almost entirely. Lead is probably like Calcium and since most of the lead compounds are insoluble we see why so little appears in the urine.

There is some indication that lead is excreted also by the skin, but this is almost negligible in amount and hence unimportant.

The problem of ridding the body of lead will now be discussed. In order to understand this we must consider the properties of lead as outlined above. Having these clearly in mind it can easily be seen that lead may be drawn out of the bones and excreted either by producing uncompensated acidosis in the body or by producing conditions which favor the excretion of calcium since lead has the same factors involved in its elimination. There are many ways to do this, but the most common will be mentioned here. It has been found that certain acids such as hydrochloric, phosphoric or lactic administered daily in small amounts produce increased excretion of lead without injury to the tissues. Also certain salts as ammonium chloride, ammonium iodide or potassium iodide do this. The ingestion of these is accompanied with a diet of low calcium content.

Phosphoric acid is one of the best agents for this use. The administration of phosphoric acid and low calcium diet may, according to Dr. A. O. Koehler, reduce the hydrogen ion concentration of the blood to a figure as low as p. H 7.19 and as soon as the administration of the acid is ceased these figures return promptly to their previously normal values.

Another less distasteful form of medication is that of ammonium chloride which is probably transformed in the body into hydrochloric acid and urea and so produces the necessary acidosis. Moreover, its influence on the excretion is nearly as great as phosphoric acid.

In accordance with our reasoning the administration of alkalies such as sodium bicarbonate should favor the deposition of lead in bone. And this is so to a certain extent; that is, if taken in too large quantities. Because of the greater solubility of tri-lead phosphate in quite alkaline as well as acid media, attempts have been made to increase the elimination of lead by rendering the tissues more alkaline than normal. Sodium bicarbonate (in doses up to 40 gms. per day) produced such an elimination. It reduced the urinary excretion of nitrogen, increased the $CO_2$ carrying power of the blood plasma and changed the hydrogen ion concentration to pH 7.55. Although sodium bicarbonate does not cause as much elimination as acids or acid-forming substances, its action continues longer after cessation of treatment than the other substances mentioned.

## Treatment.

There are two forms of lead poisoning, (a) acute and (b) chronic

The following principles must be carried out in the treatment for acute lead poisoning. (1) To drive the lead out of circulation by influencing its deposition in the bones, and (2) to produce conditions by which lead may be drawn into circulation again and excreted without producing a recurrence of symptoms.

Therefore the patient is first placed on a high calcium diet which consists mainly of calcium lactate and milk. Then after the acute symptoms disappear effort is made to draw the lead out in controlled amounts. This is done by administering phosphoric acid or ammonium chloride with low calcium intake or by taking sodium bicarbonate in large amounts without any change in diet.

In chronic lead poisoning, where perhaps the only symptom is the "lead line," the treatment consists only in drawing the stored lead out of the bone by treating with ammonium chloride, thus preventing a future acute attack.

## Reference.

Aub and others.—Lead Poisoning (Medical Monographs, 1926).

# Diagnosis of Acute Appendicitis.

By H. M. PEQUEGNAT, '32, and H. Y. WHITEHEAD, '32.

During discussions with general practitioners who are not connected with hospitals as staff members, we have been impressed with the fact that to them acute appendicitis offers little or no problem whatever in regard to high mortality. This erroneous impression is doubtless due to the fact that most of the seriously ill cases are hurried into the hospitals, which assume the burden of treatment and responsibility for the outcome. A second factor arises from the late diagnosis of cases of acute appendicitis, especially in children. It is still the tradition among the laity to administer castor oil for abdominal pain. This practice cannot be too strongly condemned. Castor oil will often precipitate perforation by producing intense peristalsis in an organ which is just at the breaking point. Appendicitis can occur in a fulminating form, but this form is too frequently the result of violent catharsis.

If the mortality from appendicitis is to be reduced, it is essential that the primary signs and symptoms of the condition should be appreciated early. It is quite evident that if recognized promptly and properly treated, the outlook is not serious. On the other hand, if allowed to progress until the appendix ruptures, the result may be, and frequently is, disastrous, the mortality ranging, in perforated cases, from 19-25%. Despite wide popular knowledge of the disease it is still unhappily obvious that many cases are not recognized and treated sufficiently early.

The so-called typical symptoms of the disease as given in many text-books often indicate a somewhat advanced stage of the condition, but if certain diagnostic features are kept in mind, it is comparatively easy to make a diagnosis in the majority of cases at an early stage.

## Clinical Features.

1. Pain—(epigastric or umbilical).
2. Nausea or vomiting.
3. Local tenderness.
4. Fever.
5. Leucocytosis.

The symptoms occur almost without exception in the above order, and when this order varies one is justified in questioning the diagnosis. If fever precedes the onset of the pain, or if vomiting accompanies or precedes the first bout of pain, it is generally not appendicitis with which we are dealing.

*Pain.*—The first and most important symptom undoubtedly is pain of a cramp-like nature usually referred to the epigastric or umbilical region and only later being super-added in the right iliac fossa. The epigastric pain is most acute in those cases in which there is considerable obstruction to the lumen of the appendix and is probably due to exaggerated peristalsis of the distended organ. The appearance of pain in the right iliac region usually occurs some hours after the onset of the diffuse pain in the epigastrium, and is probably due to inflammation of the parietal peritoneum commonly associated with inflammatory processes in the gut. Although the above is typical of the great majority of cases it must not be forgotten that occasionally the initial pain is felt: (1) all over the abdomen (in cases with perforation); (2) sometimes the pain is in the hypogastrium; (3) when the appendix is retrocaecal, the initial pain may be felt in the right iliac region.

*Vomiting, Nausea or Anorexia.*—Vomiting usually occurs in the early stages of the attack, but generally a few hours after the initial pain. Usually vomiting occurs only one or two times. Vomiting may be absent, in its place being a sense of nausea. Anor-

exia may be regarded as a lesser degree of the same sensation and often of equal value in diagnosis. The degree of nausea, or severity and frequency of the vomiting at the onset of an attack of appendicitis is considered to indicate the degree of distension of the appendix and consequently the immediate risk to the patient that perforation may occur.

*Local Tenderness.*—Some time following the umbilical crampy pains, pain is super-added in the right iliac region. At this time the most constant sign,—local tenderness, will be elicited over the site of the appendix. This point may vary dependant on the anatomical location of the appendix.

(1) When the appendix lies by the side of the ascending colon or in the iliac fossa, there will be the most definite local signs, in which the tender point is situated at a spot just below the middle of a line joining the anterior superior iliac spine and the umbilicus.

(2) If the organ is situated behind the caecum the inflammatory process may be masked by the gut lying in front, and the point of tenderness may be located far out in the flank.

(3) When the appendix hangs over the brim of the true pelvis it may be impossible to determine a tender point suprapubically. In this type of case a rectal examination is essential and will almost invariably elicit local tenderness.

*Hyperaesthesia.*—This is a frequent but inconstant accompaniment of an inflammed, unruptured appendix. Local hyperaesthesia is commonly found in an area one inch to the right of the umbilicus and on a level with it, or may be present over the whole iliac triangle (from umbilicus to anterior superior spine to pubis). The location of the area of hyperaesthesia may vary with the position of the appendix, and is probably due to the peritoneo-cutaneous reflex described by Morley.

*Rigidity.*—Local muscular rigidity over the inflamed area is frequently present, but is by no means a constant finding in the early stages. When the inflammation of the appendix has caused oedema of the contiguous portions of the abdominal parietes (whether posterior, lateral or anterior) muscular rigidity is the rule. It is a common experience not to find true local muscular rigidity in a case of appendicitis without any peritonitis. With a non-perforated appendix situated within the pelvis, local rigidity of the abdominal wall is practically always absent.

*Fever.*—Fever may not be present at the beginning of an attack, but nearly always develops within 24 hours. The initial fever is of low degree up to 101 in adults. In adults an attack of acute appendicitis is rarely ushered in by a chill. In children, however, chills may occur and the temperature may be quite high (102°-104°) early in the attack. In any suspected case the temperature should be taken every two or four hours, and if it rises in a gradual manner, it is a point in favour of appendicitis.

*Leucocytosis.*—Leucocytosis is usually present. It is found during the initial stage of the disease in those cases in which suppuration is taking place. It will not reveal, however, whether the pus is inside or outside the appendix. The white blood count may be normal, but there is practically never a leucopenia, so one cannot say that a normal leucocyte count excludes appendicitis. The usual case shows a leucocyte count of 10 - 20,000. Higher counts than this must be viewed with suspicion of some other cause than appendicitis.

Increased temperature, leucocytosis, hyperaesthesia and abdominal rigidity, should be taken for what they are worth, but their absence should not mislead one in making a diagnosis.

### Diagnosis After Perforation.

The symptoms and course of illness consequent on appendicitis with perforation are these already described with the additional signs due to a local or diffuse peritonitis. Around the perforation itself a localized abscess may

form, giving rise to a mass which is palpable on abdominal examination except in those cases in which the appendix is situated in the pelvis, when a mass will be located by rectal examination.

A diffuse spreading peritonitis should occasion no difficulty in diagnosis, since there is board-like abdominal rigidity, intense pain and tenderness of the abdomen, and a rising temperature, pulse and leucocyte count.

## Differential Diagnosis.

Since acute appendicitis can be simulated by almost all of the acute intra-abdominal disturbances and in addition by abnormal conditions arising outside the abdominal cavity, discussion of a complete differential diagnosis lies beyond the scope of this article. A few of the more common pitfalls will be briefly outlined.

*Pneumonia.*—

If the appendix occupies an abnormally high position, difficulty may arise in distinguishing this variety from pneumonia involving the base of the lung and upper surface of the diaphram. Pneumonia may be ushered in by reflex abdominal pain associated with a protective spasm of the upper abdominal muscles. Vomiting may be present. Signs of consolidation at this early stage may be wanting, especially in young children. Under these conditions a tendency to grunting respiration, movement of the alae nasi, a fever usually 102 or over, history of a chill at the onset, and dissociation of pain and tenderness, will hint at the correct diagnosis. The presence of pain or hyperaesthesia in the collar region due to referred pain along the phrenic nerve, is valuable from a diagnostic viewpoint. However, with an abnormally high location of the appendix, inflammation may extend to such a degree as to involve the diaphragm giving a positive collar sign.

If the hand is pressed slowly and firmly into the left side of the abdomen and then suddenly released, in pain due to abdominal conditions, an accentuation of the pain is referred to the site of infection. If, on the other hand, the pain is thoracic, no alteration is produced by this manouvre.

*Acute Pyelitis.*—

Right-sided acute pyelitis may be mistaken for appendicitis. The pain is accompanied by tenderness at the costo-vertebral angle, deep pressure in the right lower quadrant does not increase the pain, the temperature is much higher, chills are very common, frequency is present, and the urine contains pus. In children acute pyelitis is seen most commonly in girls. It is important to remember that the symptoms may exist for some days before pus appears in the urine, and in some cases pus may disappear from the urine due to blockage of the ureter.

*Acute Infectious Diseases.*—

(Measles, Scarlet Fever, Smallpox, Influenza). At that stage when these conditions present abdominal distress and vomiting simulating appendicitis, most of the cases have had a chill, the temperature is 102 or over. There is a leucopenia. There is dissociation of pain and tenderness, as deep pressure in the region of the appendix does not increase the pain. It is important to inquire into the patient's past history regarding infectious diseases or recent exposure to them.

*Lead Colic.*—

This is a true colic not accompanied by localized tenderness. Signs of lead poisoning such as lead line on the gums, wrist drop, or stippling of the red cells may be present. 5 cc. of 10% calcium chloride intravenously will establish the diagnosis by immediately controlling the pain due to lead colic.

*Tabes (Gastric Crisis).*—

A careful history and examination of the pupillary reflexes and knee reflex will establish the diagnosis.

*Typhoid Fever.*—

The history of onset is gradual. Chills are common. The temperature is out of proportion to the pulse rate. Leucopenia is present. At a later date

rose spots and enlarged spleen prevent possibility of confusion.

*Renal or Ureteral Stone.—*

In doubtful cases where true ureteral colic is absent, the finding of gross or microscopic blood in the urine suggests the presence of calculus. There is usually radiation of the pain downwards into the flank and testicle. Fever is rarely seen. Frequency of micturition is usually present. There is dissociation between pain and tenderness.

*Acute Salpingitis.—*

This is frequently difficult to distinguish from appendicitis. The pain of salpingitis is usually felt on both sides from the onset. The condition commonly starts with a chill and high fever 104-105. Vomiting is rare. There is a high leucocyte sound (up to 40,000). The patient is usually much too ill for an appendicitis in which no mass can be palpated or in which no evidence of a diffuse spreading peritonitis is seen. The presence of a vaginal discharge is a valuable suggestive sign. History of exposure to infection may be obtained in a few cases.

*Acute Gonorrhoeal Epididymitis.—*

This condition may be very confusing in that there is commonly present true rectus rigidity, right lower quadrant pain and tenderness, also vomiting. However, the temperature is over 102, the leucocyte count is too high, there usually has been a chill, and on palpation of the serotum the diagnosis is established.

*Cholecystitis.—*

Pain, vomiting, fever and local tenderness on the right side of the abdomen are commonly present in both appendicitis and cholecystitis. Remember that in acute cholecystitis jaundice is rarely present unless there is obstruction of the cystic duct. Usually a tender, rounded gall-bladder is palpable, and the gross local findings are accompanied by surprisingly little constitutional disturbance. The leucocytosis is relatively greater than that occurring with appendicitis. In very stout subjects it may be almost impossible to diagnose whether the gall-bladder or the appendix is the offender, unless the previous history is indicative of one or other condition.

*Perforated Duodenal Ulcer.—*

Perforation usually results in a pain of sudden onset and is accompanied by great initial shock. The abdominal wall soon takes on a board-like rigidity such as is never seen at an equally early stage of appendicitis. However, there are less sudden perforations in which the duodenal contents slowly escape and may travel down to the iliac fossa giving rise to all the signs of appendicitis. Pain in the shoulder area is in favour of perforated ulcer rather than appendicitis. A story suggestive of ulcer-like symptoms previous to the sudden attack of pain is a valuable aid in diagnosis. Obliteration of liver dullness in absence of general abdominal distension is certain evidence of perforation of an ulcer.

## Bibliography.

1. Barrington-Ward.—Abdominal Surgery of Children.
2. Cope.—Early Diagnosis of the Acute Abdomen.
3. Dodd.—Practitioner, Feb., 1932.
4. French.—Differential Diagnosis.
5. Gask and Wilson.—Text-book of Surgery.
6. Homans.—Text-book of Surgery.
7. McDonald.—U. of T. Med. Journal, 1929.
8. Morley.—Abdominal Pain.
9. Ward.—Acute Abdominal Diseases.

## Literature and Medicine.

By H. B. A. MACFIE, '36.

Literature and medicine are two words which call to the minds of most, if not all men, thoughts separated by an apparently yawning and impassible gulf. Yet, if we but consider these two words a while there must appear to the discerning a similarity, for is not literature the cure for minds made stagnant by an overpowering dullness and souls shattered by the cruel realities of life; and is not medicine the cure for bodies diseased and strength lost?

The final expression of literature is the book, and the final expression of medicine is the physician — both similar in that either can degrade to depths undreamt of or elevate to heights unscaleable the art which each represents. Just as a book is not rendered good by being in a richly furnished and palatial library, so is a physician not necessarily good because surrounded by all the appurtenances of wealth. Neither is a bad book made the better because read by a king, nor a physician because he is in attendance upon a king; but if the book that the king reads be good, then should he honour and respect it; and, similarly, if a good physician attend a king, then the latter should honour and respect the former, and not the former the latter, unless he possess qualities which deserve to be honoured and respected.

Some of the greatest literary men were also medical men, and as I write there comes immediately to my mind Tchekoff, Schiller, Holmes, Bridges, Osler, Locke, Browne, Darwin, Huxley, Rabelais and Conan Doyle. There are others, but these come to mind first, and therefore I will write upon them, as space and time do not allow me to delve deeper. Schiller, before he became one of Germany's greatest poets and philosophers, second only to Goethe, was a doctor in the army of a German prince. He commenced the study of law, but soon after changed to the more congenial pursuit of medicine. He pursued the study of medicine with distinction, and this, with his great faculty for literary production, and his poetry, was the foundation on which rested his tremendous genius. Thus a medical man became one of the greatest literary figures of Germany. It is true that Schiller soon abandoned his profession, but he merely abandoned it to become a healer of the mind instead of the body.

Tchekoff, whilst a medical student at Moscow, wrote many of the short stories which are among the masterpieces of Russian literature. In straitened circumstances, it was necessary for him to be self-supporting, and eventually the means to an end became the end itself. Just as John Hunter cut through the fascia of nature and exposed its palpitating tissues, so also did Tchekhoff cut through the superficial trappings of life and lay bare the soul of man with all its thoughts and impulses.

Oliver Wendell Holmes will ever be known as one of America's chief literary masters, and one of whom Americans and the whole English-speaking world are justly proud. For a considerable part of last century he was Professor of Anatomy at Harvard University.

Robert Bridges, who practised medicine for a considerable length of time, was Poet Laureate in the latter years of his life. Sir Thomas Brown in the "Religio Medici" has given to the world one of the truly great books of all time, and the writer was a practising physician to the day of his death. Locke, who was an anatomist, was also one of England's greatest philosophers, and produced immortal philosophical works.

Rabelais, the great enemy of all superstition, injustice and deceit, and one of the chief agents in converting the darkness of the Middle Ages into light with his great book, "The Ad-

ventures of Pantagruel," started his career as a monk, but ended by studying medicine at the University of Montpellier in France. Thus was one of the treasures of the French language produced by a doctor. Osler, Darwin and Huxley are examples of men who had they not possessed great literary craftsmanship would have had to coop up their theories and ideals and allow them to lie stagnant and unexpressed, lost to humanity. For in the same way as dung, in the stable, rots and becomes putrescent, but when put into the fields enriches the trees and plants and causes them to bring forth fruits and flowers, so do the imprisoned thoughts of a man die with him — when if but the prison doors are opened by the glowing sentences and rich words of a literary masterpiece, to mankind is given a beauty and a knowledge and a wisdom to add to the knowledge obtained before, and so build up a bulwark against all the inundations of ever-progressing life.

In the time of the Ancients and in the Middle Ages literature was a part and parcel of medicine, and those who would lay bare their discoveries or theories to the world had to be no mean exponents of the art, otherwise no ears would hear, no eyes would see, and no minds would garner what they had to offer. Many a treatise on medicine was written in poetical form, and one of the greatest examples of this is the poem on syphilis by the Italian Fracastorius; and Sir William Browne is said to have drawn his medicine from the aphorisms of Hippocrates.

In these days of quick communication the need of literature in medicine is not quite so apparent; but if what you have to offer is not to rot or die, and if it is worthy that it should not rot or die, then it must be put in writing where it will live for all men.

Conan Doyle, Warwick Deeping and W. Somerset Maughan are more modern examples of medical men who have turned to literature and made their name in it. Before ending, I would like to mention Dr. William Henry Drummond as a physician who has done much to establish a true Canadian literature. Dr. Drummond was a graduate of the Bishops Medical College of the year 1884, and of him I might well quote the lines by S. Weir Mitchell, M.D., LL.D.:

"He made his own the thoughts of simple men,
And with the touch that makes the world akin,
A welcome guest of lonely cabin homes,
Found, too, no heart he could not enter in."

Thus we see that literature and medicine tread a path not dissimilar,—a path which is beset by the same obstacles and the same delights. The keystone of both is the observation of the ways of Nature and of Man himself. It is not given to many the ability to deal with them in two ways, that is in the medical and the literary. But although the obstacles of both arts may not be overcome by many, yet the delights of both arts can be participated in by all—and here the "Aesculepiads" have the advantage over the followers of the Muses in that the former can partake of the pleasures of the latter who cannot so easily do the reverse.

Literature is therefore a shady bower to which those who are participants in its delights may retire when enervated by the noonday heat of existence.

I append the following taken from "Philobiblon," by Richard de Bury: "How easily, how secretly, how safely in books do we make bare without shame the poverty of human ignorance! These are masters that instruct us without rod and ferrule, without payment of money or clothing. Should ye approach, they are not asleep, if ye seek to question them, they do not hide themselves; should ye err, they do not chide; and should ye show ignorance, they know not how to laugh. O Books! Ye alone are free and liberal. Ye give to all that seek, and set free all that serve you zealously."

# The Interpretation of Respiratory Quotients.

By O. M. SOLANDT, B.A.

Not so many years ago it would have been considered nothing less than rank heresy to question the classical interpretation of the significance of an R.Q. No doubts had then arisen concerning the meaning of an observed R.Q. Metabolism in the body was regarded as nothing more than ordinary combustion. The old interpretation might have been, and indeed still is supported by some such arguments as this.

There are only three types of food available for oxidation in the animal. It is easy to measure the R.Q. when these foods are burned outside the body. Since the proeess of combustion in the body is the same as in the calorimeter the R.Q. must be the same. Thus the R.Q. of a person at any time and under any conditions must always represent the resultant of the combustion of protein, fat, and carbohydrate. Each of the three types of food burns with a typical R.Q. That for fat is about 0.71, for protein about 0.82, and for carbohydrate 1.00. If the proportion of the metabolism which is due to the oxidation of any one of these three foodstuffs were known, the remainder of the metabolism could easily be divided between the other two. It is easy to find how much protein is burned during any given period beeause when protein is burned the nitrogen must all be excreted in the urine or the sweat. The amount excreted in the sweat is negligible so the urine nitrogen is a satisfactory index of protein catabolism. The average percentage of nitrogen in protein is about 16, henee if the urine nitrogen is multiplied by 6.25 the result is the number of grams of protein that was eatabolised in the period immediately preceding the collection of the urine. The amount of oxygen used and carbon dioxide produced in burning one gram of protein ean be calculated. Hence that portion of the total observed gaseous exchange which is due to the combustion of protein ean be calculated and subtracted from the total exehange. The resultant amounts of carbon dioxide and oxygen represent the catabolism of fat and carbohydrate alone. The ratio of the earbon dioxide to the oxygen is the non-protein R.Q. From this non-protein R.Q. it is easy to calculate the pereentage of the non-protein metabolism which can be assigned to earbohydrate and the percentage which ean be assigned to fat. In fact any eomplete text book of physiology contains a table giving the percentages of fat and carbohydrate oxidised at any R.Q. from 0.7 to 1.0. Thus a study of the nitrogen excretion in the urine and of the R.Q. enables the experimenter to aeeurately divide the total metabolism between the three types of food. If, in addition, the oxygen consumption or the heat output is measured the absolute amount of each material used during a given period ean be calculated.

Some such presentation of the ease has led many an experimenter to believe that the R.Q. is an infallible weapon with which to attaek many of the problems of animal metabolism. It appears to present an unbiased and never failing index of the nature of the substances being burned.

In reeent years it has beeome increasingly apparent that even the measurement, not to mention the interpretation , of an R.Q. eannot be undertaken without elaborate preeautions to avoid pitfalls. Each year has brought to light some new possibility for misinterpretation. Many of the most ardent users of the R.Q. as a weapon are beginning to view it with considerable distrust, and a few have gone so far as to cast it from them entirely.

The weakness of the old view of the R.Q. lies in the assumptions upon which it is based. In order to accept the old interpretation it is necessary to assume, among other things, that food

absorbed into the body is directly oxidised and does not undergo any transformations. This does not mean that there can be no intermediate stages in the oxidation, but merely that no intermediate products can be stored or excreted. The oxidative process must always be continuous and complete once it is initiated. It is this assumption in particular which has been attacked in recent years.

The R.Q. first came to be viewed with suspicion when observers obtained R.Q.'s over unity. If the R.Q. is regarded as the resultant of combustion only, then an R.Q. over unity cannot exist. Conversely, if it can be proven that true metabolic R.Q.'s over one do occur then the R.Q. can no longer be considered to represent the gaseous exchange of combustion only.

The recent discovery that R.Q.'s over one are observed after sufficiently violent muscular exercise has focussed attention on that phase of the study of metabolism. Early workers who studied the metabolism during exercise sometimes obtained R.Q.'s above one, but they did not include the recovery period. Since Hill and others have shown that the gaseous exchange which can be attributed to a short bout of muscular exercise does not all occur during the exercise this early work is no longer significant. Hill showed that the oxygen requirement of the muscles during strenuous exercise cannot be met by the oxygen intake. An oxygen debt is incurred and is paid off after the exercise. At the same time respiration is greatly stimulated by the appearance of lactic acid in the blood, with the result that $CO_2$ is blown off. During recovery $CO_2$ is retained to make good this loss and the acid balance is once more restored to normal. When these facts were realized and the metabolism was followed for a sufficient length of time after exercise to allow complete recovery R.Q.'s over one were not often obtained.

The problem was again revived when the idea of calculating the excess metabolism of exercise was introduced by Furusawa in 1925. It now seems certain that the R.Q. of the excess metabolism due to exercise (i.e. the metabolism over and above the resting level) is over unity, in some subjects at least, if the exercise is of sufficient severity. However, the fact that the excess R.Q. is over unity does not necessarily discredit the gross R.Q. because the significance of an excess R.Q. is even more open to question than that of the gross. It seems doubtful, in the light of recent work on the duration of the recovery period, if a gross R.Q. significantly over one has ever been obtained for exercise and complete recovery. Nevertheless R.Q.'s closely approaching one have been obtained. It is obvious that, if the R..Q of the whole gaseous exchange over a period of 1½ hours is unity, and if the R.Q. at the beginning and end of that period is 0.80, then the R.Q. must have risen considerably above one at some time during the period. It therefore seems fairly certain that the metabolic R.Q. does rise above one at some time during exercise or recovery. The most obvious argument against the validity of these high R.Q.'s is the possibility that, during the period when lactic acid is being removed from the blood, the kidney excretes alkali. In this way the amount of $CO_2$ retained during recovery would be much less than the amount blown off and the observed R.Q. for exercise and recovery would be falsely raised. It is improbable that this excretion of alkali accounts for the high R.Q.'s observed, but the possibility must be admitted.

R.Q.'s over one have also been obtained under conditions where there was no reason to suspect any disturbance of the acid-base balance. Cathcart and Markowitz found that the administration of 50 grams of sucrose, levulose or dihydroxy acetone to a subject in the basal state would cause the R.Q. to rise to over unity. The R.Q. one half hour after the ingestion of 50 grams of dihydroxy acetone was 1.15.

Not only high R.Q.'s but also low ones have aided in the overthrow of the traditional interpretation of the

R.Q. The consistently low R.Q.'s observed in diabetics were formerly advanced as evidence of the inability of the diabetic animal to use glucose. However, it has been shown that the diabetic animal can, and does, use glucose almost as well as the normal animal. This and other evidence has led to the overproduction theory of diabetes. The overproduction theory states that the fundamental metabolic defect in diabetes is not an inability of the tissues to use sugar, but is an overproduction of sugar from fat and protein in the liver and possibly in other tissues as well. The overproduction theory of diabetes is widely accepted and is well supported by experimental evidence. If this theory is accepted the idea that the low R.Q. in diabetes is due to the preponderance of fat combustion must be abandoned.

It has long been acknowledged that the conversion of carbohydrate to fat in the animal body is a possibility. The R.Q. of this process is thought to be very high, in some cases $CO_2$ may be produced with no oxygen usage. Very high R.Q.'s have been observed in animals just before hibernation, when they are presumably depositing fat.

The reverse process, namely the conversion of fat to carbohydrate, is not universally regarded as being a normal or even a possible occurrence in the body. However, evidence is accumulating in support of its possibility and it is likely that before long the occurrence of the transformation from fat to carbohydrate in the body will be established beyond all doubt. The change definitely does take place in plants. The R.Q. of this process is said to be very low, in some cases as low as 0.28.

Most of the unusual R.Q.'s observed can be tentatively explained if these two conversions, carbohydrate to fat and fat to carbohydrate, are assumed to be possible. Thus high R.Q.'s can be supposed to be due to the transformation of carbohydrate to fat and the low ones to be due to the reverse change. It must be remembered that these transformations can only affect the R.Q. if the product resulting from the change is stored or excreted. Thus if fat is changed to carbohydrate and the carbohydrate immediately oxidized, the R.Q. of the process will be 0.7, not 0.3 or less, as would be the case if the carbohydrate were stored or excreted.

The low R.Q. in diabetes is readily explained on the basis of an excessive transformation of fat to carbohydrate with excretion of the excess carbohydrate not needed by the body. The normal oxidative processes in the tissues need not be altered at all. All the metabolic changes seen in diabetes can be explained on this overproduction theory, but it would be out of place to go into the explanations here.

The high R.Q.'s observed by Cathcart and Markowitz may be similarly supposed to represent the transformation of carbohydrate to fat.

It therefore appears that the R.Q. does not always represent the gaseous exchange due to oxidation, but may also be influenced by the interconversion of food stuffs. It might be said that the non-protein R.Q. represents the algebraic sum of the transformations, carbohydrate $\rightleftharpoons$ fat plus the oxidation necessary for the supply of energy. It is impossible to tell, by present methods, the direction in which this reaction is tending at any time. Thus a non-protein R.Q. of 0.82 might conceivably result from any of the following combinations of processes:

(1) Exclusive oxidation of fat with conversion of carbohydrate to fat.

(2) Exclusive oxidation of carbohydrate with conversion of fat to carbohydrate.

(3) Oxidation of any intermediate mixture of fat and carbohydrate balanced by a suitable transformation.

Only when the organism is in perfect dynamic equilibrium would the R.Q. of 0.82 represent the combustion of 38.8% carbohydrate and 61.2% fat, which the tables say is necessary to give a non-protein R.Q. of 0.82.

The gross R.Q. offers many more possible interpretations than the non-pro-

tein R.Q., and speculation upon these possibilities does not seem worth while here.

It seems safe to conclude that the old idea that the R.Q. is an index of the nature of the fuel being oxidized by the tissues is rapidly being abandoned. It is being replaced by the conception that the R.Q. reflects not only oxidations, but also transformations of food stuffs within the body.

The new conception introduces many new variables into the study of the R.Q. Until these variables can be satisfactorily controlled or measured, the R.Q. loses its utility as a means of determining the nature of the fuel used by the body under varying conditions. At the present time there is no indication that any progress is being made toward controlling these variables. Hence the new view of R.Q.'s has destroyed the old methods of interpretation without putting anything concrete in their place. The net result is that a single interpretation of any R.Q. can no longer be justified. It is, however, quite probable, but entirely unproven, that the old interpretation is still applicable to R.Q.'s observed in the strictly basal state when the possibility of the occurrence of transformations is remote.

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## Irregular Practice and Wonder-cures.

By H. B. ANDERSON, M.D.

A simple manipulative procedure for the treatment of rheumatic and other diseases has recently gained wide notoriety for a village doctor in Eastern Ontario. Whether the method possesses any merit beyond that which results from the patient's faith in its efficacy, may safely be judged in the light of previous experience, which clearly shows that popular approval is not a safe criterion of the intrinsic value of any therapeutic measure.

Reputable physicians ordinarily recognize medical societies and medical journals as the proper mediums for their communications, and appreciate the necessity for submitting full and accurate information, and affording every opportunity for the examination and observation of cases in order that independent opinion as to the value of any treatment may be arrived at. They naturally look for case histories, details of clinical and laboratory examinations, diagnoses, progress notes, analyses of results, and other data, as the only basis for an intelligent opinion. Therefore, until trustworthy evidence is forthcoming, the claims on behalf of the treatment may be disposed of by the Scottish verdict: "not proven."

It is charitable to admit that an honest physician may over-estimate his own skill and attribute to his treatment virtues that it does not possess, though occasionally the unwarranted claims emanate from patients more than from the physician. The vis medicatrix naturæ, the natural tendency of many diseases toward cure or improvement from time to time during their course, and the influence of a strong faith and fervent hope, are undoubtedly the active, though often unrecognized, ingredients of wonder-cures that excite the public.

Nothing is more fully established than the tremendous influence exercised by the mind and emotions on bodily functions, and it is well known that an assured faith in the physician, the remedy or other means, produces improvement or cure in many cases of a functional or psychoneurotic nature, and may have a favorable influence on the co-incident functional element in organic diseases.

Psychotherapy was successfully practised in the Greek and Roman temples of Aesculapius, and, knowingly or not, has been practised by all successful physicians throughout the following centuries. Charcot, after a life devoted to the study and treatment of nervous diseases, expressed the opinion that

"the best inspirer of hope is the best physician." While his opinion may not safely be applicable to the treatment of organic diseases, it at least emphasizes the importance which a master of our art attached to psychotherapy.

To be successful, a physician must have faith in himself and the measures he employs, and be able to stimulate faith and confidence in his patients. The psychotherapeutic effect of a thorough and intelligent examination in itself unconsciously impresses the patient with a physician's knowledge of his case, inspires confidence and hope, and allays fears and anxieties which may stand in the way of recovery.

To understand the influence of the emotions on organic functions, and their role in the causation of disease, medical students should be familiar with the experimental investigations of Pawlow, Cannon, Crile and others, which afford a scientific explanation for many of the phenomena of functional diseases.

The clinical aspect of the question and the application of psychotherapy in treatment is discussed in a series of excellent papers by Allbut, Osler, Morris, and other eminent clinicians, in the British Medical Journal in 1910 and 1911.

The properly educated and trained practitioner recognizes that the chief application of psychotherapy is in psychoneurotic and functional diseases, he is aware of its limitations and the dangers attending its use, to the neglect of other measures, in organic diseases. An intelligent and honest physician will not attempt to establish faith on a basis of falsehood, misrepresentations, or on assertions contrary to scientific facts and clinical knowledge.

Doctors are often accused of being impatient of lay criticism or suggestion, and of an unwillingness to admit the possibility that useful information occasionally may arise outside the profession. A pontifical attitude which would prevent the open-minded consideration of the possible value of even unlikely remedies certainly is not a scientific one, and has not characterized the leaders of the profession.

The medicinal value of the coca leaf was first suggested to physicians from the observation of its use by South American Indians: Withering was lead to the investigations of digitalis leaves by noting the value of an old Shropshire woman's brew of herbs in the treatment of dropsy; Edward Jenner got the hint from Gloucestershire milkmaids which led to the discovery of vaccination against smallpox. Jesuit missionaries first suggested the use of cinchona bark in the treatment of malaria. It was from the Iroquois Indians that Jacques Cartier learned of an infusion of the bark and branches of the spruce (anedda) as an effectual remedy for the scurvy ravaging his crews, and long afterwards a wider application of the principle underlying the treatment is observed in the use of fresh fruits and green vegetables, though a scientific explanation for the treatment was not forthcoming until the discovery of vitamins. Pasteur, a chemist and not a physician, is recognized as the outstanding figure in the advancement of scientific medicine in the past century.

If experience is a good teacher, and if wise men learn by their mistakes, so may they also learn from the mistakes of others. Therefore, the regular profession may learn something from the errors of the cults and irregulars as well as from those of the quacks and impostors.

Homoepathy may be credited with having emphasized, though unintentionally, the curative power of unaided nature, as well as the evils of polypharmacy and the excessive use of drugs.

Notwithstanding the extravagant claims of Christian scientists, the absurdity of the doctrines on which the system is based, and the positive dangers attending its application in communicable and organic disease, it has at least emphasized and exploited the importance of mental and nervous influences on bodily functions, and the value of emotional control in the treatment of disease.

Osteopaths, chiropractors, and bone-setters can be credited with nothing of scientific and little of practical value, unless it is to emphasize that manipulative treatment, though fraught with danger when ignorantly applied, is occasionally of use in chronic and neglected "rheumatic" complaints affecting the joints and the spinal column. The fact that osteopaths and chiropractors apply their treatment personally, places them in a favorable position to exercise a strong psychotherapeutic influence on their patients, whereas physicians usually use mechanotherapy through masseurs or other intermediaries, and any failure on their part to co-operate with the physician may compromise the success of the treatment.

In view of the great advancement of scientific medicine in the past century, the progress of preventive medicine and in the diagnosis and treatment of disease, it may be disappointing that quackery and irrational methods successfully appeal to so many people, but no doubt there still persists a considerable residuum of the primitive belief in the supernatural origin of disease and in the efficacy of wonder-cures, charms and other superstitions. As the days when the Royal touch was the accepted cure for the King's evil, many things still "work like magic," and perhaps for many a day some credulous people will continue to put a horse-shoe over the door or carry a rabbit's foot in the pocket for luck; use a horse chestnut for the cure of rheumatism, a peony root to ward off insanity, or place faith in the extravagant and absurd claims of quacks and irregulars.

However, it is encouraging to know that eclecticism has disappeared, homoepathy has dwindled in numbers and influence, and osteopathy, having adopted the medical curriculum to a large extent in its best schools, has discarded its early pretensions, and now has little excuse for its existence as an exclusive cult.

The most effective means of dealing with irregular practice and irrational or fraudulent methods and nostrums, is to subject their claims to scientific investigation and leave them to be adjudged on the basis of established facts. A plan of campaign to educate the public by setting forth reliable information has been successfully undertaken both by the American and British Medical Associations. The legislation requiring the manufacturers and vendors of patent and proprietary medicines to print formulæ on the labels, informing the public of their ingredients, has done much to abate a widespread evil.

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## THE NEW WORK ON FAT METABOLISM.

A new field of investigation with unknown, but fascinating possibilities, has been opened up by recent work in the Department of Physiology of this University. In 1928, J. M. Hershey, then Chief Chemist in the Insulin Committee Laboratory, and now a student in fourth year medicine, began the tedious experiments which revealed the fruitfulness of this unexplored region. The clue had been supplied by the well-known fact that depancreatized dogs must be given raw pancreas as well as insulin, if they were to be kept alive many months. The untimely death of these animals had been blamed on lack of pancreatic digestive ferments, but the feeding of raw pancreas appeared to have solved the problem.

Oddly enough, however, the animals died with jaundice, and at post-mortem their livers were found to be fairly strangled with fat. How these phenomena could be related to the action of any known pancreatic enzyme was hard to see. Could any other constituent of raw pancreas be exerting this beneficent influence? After some mental process of elimination Mr. Hershey decided to try lecithin. It worked! Dogs jaundiced and on the verge of death were revived and restored to health by adding lecithin to their food. Progress with these experiments, in which Dr. Soskin participated, was slow and painful, for it often took

months to get the dogs jaundiced and months to cure them. To repeat the experiment a few times on the same animal would occupy about a year.

At this point the resources of the Department of Physiology were brought to bear on the problem by the Professor, and recently Miss M. E. Huntsman, Mr. Hershey and Dr. Best turned to normal animals. The small livers of normal white rats, so it turned out, could quickly be made very fat indeed by the feeding of a fat-rich diet. Rats fed the same diet together with some lecithin did not develop fatty livers. Lecithin, as pure as it could be made, and free from vitamines, was responsible for this remarkable effect. But lecithin is a very complex substance containing choline, fatty acids, glycerol and phosphoric acid. Further experiments, as yet unpublished, seem to show that choline, alone, is the active substance. Here then is the chemical compound which seems to be necessary for the proper utilization of fat in the body. What a striking analogy to insulin! One cannot help thinking, with premature hopefulness perhaps, of those diseases such as cholelithiasis, Dercum's disease, and simple obesity, in which the fat metabolism is disturbed. Whatever the outcome, a keen interest has been reawakened in the sadly neglected subject of fat metabolism. The impetus given to research by this discovery will be felt in Toronto and throughout the world for many years. Who can foretell the results? J.K.W.F.

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## Book Notes.

**"Aequanimitas" with Other Addresses: Sir William Osler.**
**(Lewis & Co., 1910).**

The deep understanding with which, by reason of a life spent in the interests of medicine, William Osler views the life of the medical student and early practitioner, is the essence of this collection of his addresses. They are of widely varied topics, but so written that each individual idea is brought out and shown clearly to the mind of the reader, before giving way to its successor. The style of writing is truly literary, and we would do well to read these addresses, not as a duty, but as a pleasure.

The title address expresses a conception of the qualifications most desirable in a doctor; equanimity and imperturbability. The topic is well developed and logically supported.

Chapters on "Doctor and Nurse," "Teacher and Student," describe, along with others, the contacts of a doctor's life. Such sections as "The Army Surgeon" treat one field of medicine and the opportunities it has to offer to the graduate.

In reading Osler, one feels continually the atmosphere of books, and he deals in a concise but adequate way with works which are of particular interest to medical men in a chapter entitled "Some Aspects of American Medical Bibliography."

In the section devoted to "Teaching and Thinking," some very clear ideas are advanced for the consideration of all medical students, and merit a close examination.

As a whole, the book is almost prerequisite in the library of a medical student, just as were the books to which Sir William so often refers. The importance of a broader education than that found in the medical curriculum is clearly shown. We learn that a doctor may, in fact he almost must, be a teacher, orator, and writer as well. Not only that, but the means of attainment is given along with invaluable hints for a fuller medical student life.

We have in this volume something to which we may turn in various difficulties, and find a new viewpoint, a new conception of our task, told in a manner at once admirable and delightful. H. C. B.

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